Claims

1. An echo canceler for reducing echoes resulting from a far-end signal and adaptable during a double-talk event, the echo canceler comprising:

an adaptable filter to filter the received far-end signal and provide an echo estimate; and

an adaptation module in communication with the adaptable filter to update the adaptable filter, the adaptation module to receive a microphone signal and separate a near-end signal from the microphone signal using a blind source separation algorithm.

2. The echo canceler of claim 1, wherein the adaptable filter includes a finite impulse response filter.

3. The echo canceler of claim 1, wherein the echo canceler further includes a preprocessing module in communication with the adaptable filter and adaptation module, the preprocessing module to whiten the far-end signal and decorrelate the microphone signal.

4. The echo canceler of claim 3, wherein the preprocessing module includes,

a first decorrelator to receive and whiten the far end signal, and

a second decorrelator to receive and decorrelate the microphone signal.

5. The echo canceler of claim 3, wherein the preprocessing module includes a recursive least-squares structure.

6. The echo canceler of claim 5, wherein the preprocessing module includes a recursive least-squares systolic array.

7. The echo canceler of claim 5, wherein the preprocessing module includes a recursive least-squares lattice-ladder.

8. The echo canceler of claim 3, wherein the preprocessing module maximizes a criterion of measure to increase the statistical independence of the near-end signal from the far-end signal.

9. The echo canceler of claim 8, wherein the criterion of measure is negentropy.

10. The echo canceler of claim 1, wherein the blind source separation algorithm is a gradient negentropy algorithm.

11. A method for reducing echoes resulting from a far-end signal, the method comprising:

receiving a microphone signal including a near-end signal and echoes;

applying a blind source separation algorithm to the microphone signal to separate the near-end signal;

updating an adaptable filter based on the echoes;

the adaptable filter, filtering the far-end signal to provide an echo estimate; and

applying the echo estimate to a microphone signal to substantially remove echoes.

12. The method of claim 11, wherein the adaptable filter comprises a finite impulse response filter.

13. The method of claim 11, further comprising:

whitening the far-signal; and

decorrelating the microphone signal from the far-end signal.

14. The method of claim 13, wherein whitening the far-end signal is performed by a first decorrelator and decorrelating the microphone signal is performed by a second decorrelator.

15. The method of claim 13, wherein whitening the far-end signal and decorrelating the near-end signal is performed by a recursive least-squares structure.

16. The method of claim 15, wherein the recursive least-squares structure is a recursive least-squares systolic array.

17. The method of claim 15, wherein the recursive least-squares structure is a recursive least-squares lattice–ladder.

18. An echo canceler for receiving a microphone signal including a near-end signal and echoes resulting from a far-end signal, the echo canceler reducing the echoes and adaptable during a double-talk event, the echo canceler comprising:

a preprocessing module to whiten the far-end signal and reduce signal correlation in the microphone signal; and

a blind source separation module, in communication with the preprocessing module and including,

an adaptable filter to filter the whitened far-end signal and provide an echo estimate, and

an adaptation module to update the adaptable filter and to receive the decorrelated microphone signal and separate the near-end signal from the microphone signal using a blind source separation algorithm.

19. The echo canceler of claim 18, wherein the adaptable filter includes a finite impulse response filter.

20. The echo canceler of claim 18, wherein the preprocessing module includes,

a first decorrelator to receive and whiten the far end signal, and

a second decorrelator to receive and decorrelate the microphone signal.

21. The echo canceler of claim 18, wherein the preprocessing module includes a recursive least-squares structure.

22. The echo canceler of claim 21, wherein the preprocessing module includes a recursive least-squares systolic array.

23. The echo canceler of claim 21, wherein the preprocessing module includes a recursive least-squares lattice-ladder.